IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Ryuzo UENO, et al.

Appln. No.: 10/574,472 Group Art Unit: 1796
Confirmation No.: 9123 Examiner: Liam J HEINCER
Filed: April 3, 2006
For: LIQUID-CRYSTALLINE POLYESTER RESIN

DECLARATION UNDER RULE 1.132

Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Motoki ASAHARA, citizen of Japan and residing in Sanda-shi, Hyogo, Japan do declare and say as follows:

1. I am a graduate of Faculty of Education, Course for Junior High School Teachers, Osaka Kyoiku University, Osaka, Japan in 1996, and received Master degree of Engineering from Department of Applied Chemistry, Graduate School of Engineering, Osaka University, Osaka, Japan in March, 1998.

2. Since April, 1998 up to this time, I have been an employee of Ueno Seiyaku Kabushiki Kaisha, the assignee of the above-identified application, and have been engaged in the research and development work in the field of organic synthesis.

3. At present, I am a member of The Chemical Society of Japan.

4. I am one of the inventors of the above-identified application and am familiar with the subject matter thereof.

5. I have read the Office Action mailed December 9, 2008 and the references cited therein and am familiar with the subject matter thereof.

6. In order to show melting point of the polymer obtained by the Example disclosed in Calundann (US 4,219,461) when determined by the procedure disclosed in the instant application and show unexpected effects of the invention claimed in the above-identified application, the following experiments have been done under my direction.

Experiment

I: Preparation of the Polymer according to the Example disclosed in Calundann

To a three neck round bottom flask equipped with a stirrer, nitrogen inlet tube and a distillation head connected to a condenser were added the followings:

(a) 241.6 grams of 6-hydroxy-2-naphthoic acid (1.28 mole),
(b) 237.0 grams of p-hydroxyybenzoic acid (1.72 mole),
(c) 110.1 grams of hydroquinone (1.00 mole),
(d) 166.1 grams of terephthalic acid (1.00 mole), and
(e) 523.9 grams of acetic anhydride (5.13 mole)

The molar ratio among the starting materials were the same as the Calundann.

The atmosphere in the reaction container containing the above ingredients was exchanged by inert nitrogen by means of a three cycle nitrogen/vacuum purge. The bath temperature was increased from the room temperature to 145°C over 80 minutes and kept at the temperature with stirring for 30 minutes. Then, the bath temperature was increased to 250°C over 130 minutes with removing the generated acetic acid from the mixture to complete acetylation of 6-hydroxy-2-naphthoic acid, p-hydroxybenzoic acid and hydroquinone. As a result of the acetylation, a mixture of 6-acetoxy-2-naphthoic acid, p-acetoxybenzoic acid and hydrxoquinone diacetate was generated in the container.

Then the bath temperature was gradually increased to 310°C over a period of 5.5 hours while acetic acid was distilled from the polymerization vessel. The polymerization melt was rapidly stirred under a slow nitrogen flow for an additional

2 hours at 310°C and then subjected to a series of reduced pressure stages. The nitrogen flow was halted and the pressure was reduced to about 690 mmHg for about 1 hour. The pressure was next reduced to 0.5 mmHg and the viscous melt stirred for 10 hours at 308° to 312°C. During these stages the polymer melt continued to increase in viscosity. When the viscosity became too high to stir the mixture, the pressure was increased to the ambient pressure by introducing nitrogen gas to stop the reaction.

The obtained polymer was melt extruded and quenched in ambient air. Then, the polymer was crushed with a crusher to give flake-shaped pellets. The obtained pellets were then dried in a circulation dryer at 110°C for 60 minutes to give about 550g of the polymer sample.

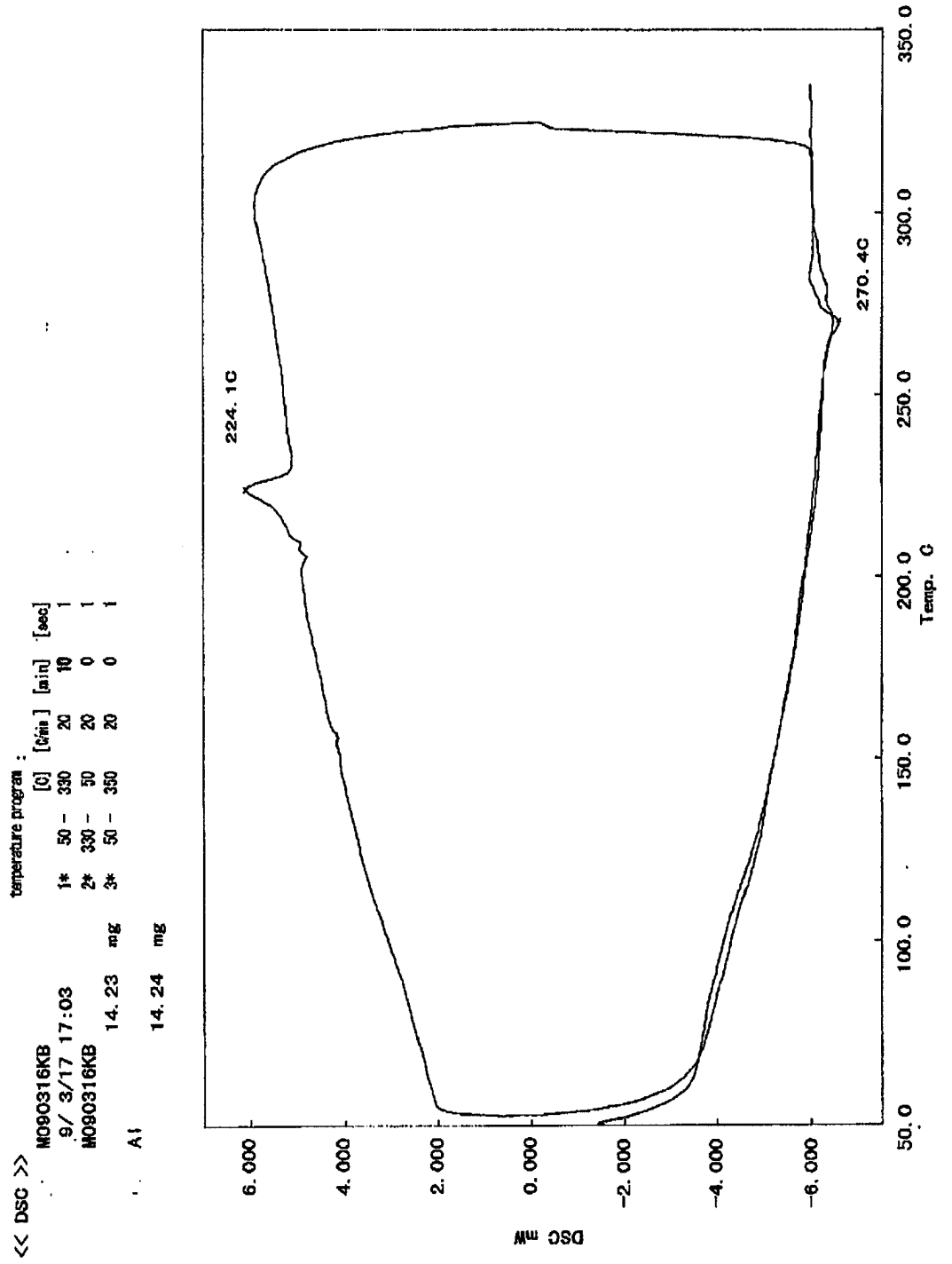
II. Determination of the Melting Point with DSC

The differential scanning calorimeter Exstar 6000 (Seiko Instruments Inc., Chiba, Japan) was used.

The polymer sample obtained above was heated from 50°C to 330°C at the rate of 20°C/minute, and kept at 330°C for 10 minutes, then, cooled to 50°C at the rate of 20°C/minute. The polymer sample was heated again at the rate of 20°C/minute to 330°C and the observed endothermic peak was recorded. The temperature of the endothermic peak found in the final step was recorded as melting point.

III. Result

The DSC chart obtained by the above procedure is shown below. The obtained melting point (melt endotherm) was 270.4°C.



7. Discussion

In this experiment, the polymer sample was prepared

according to the procedure disclosed in Example of Claundann and the melting point of the polymer was determined according to the procedure disclosed in [0035] of the originally filed specification of the instant application using the same instrument. As shown in the chart shown above, the melting point of the polymer sample determined by DSC was 270.4°C.

The molar ratio of the starting materials used in this experiment is the same as those in Calundann. Although this experimental data used compounds having hydroxy groups instead of acetylates as the starting materials and had the step of acetylation, the synthesizing procedure should be deemed substantially the same as Calundann in which already acetylated monomers were used as starting materials. In addition, while Calundann reduced the pressure to 0.02-0.1mmHg in the last step, the pressure in this experiment was reduced to 0.5mmHg. This was because the pump performance used in the experiment and to compensate the difference, the time for stirring was extended (5.5 hours in Calundann and 10 hours in this experiment). Accordingly, the polymer sample obtained by this experiment was substantially same as the polymer obtained in Example of Calundann.

The melting point of the LCPs of the instant claims determined by DSC is within the range of 190-250°C, and the melting points actually observed in the working examples disclosed in the originally filed specification are 210-230°C. In contrast, the melting point of the polymer obtained by the example of Calundann is 270.4 °C. The latter is at least 40°C higher than the working examples and at least 20°C higher than the claimed range. The lower melting point of a polymer allows lower molding temperatures and therefore, widely expands the possibility of the other resins or components used with the claimed LCP for manufacturing molded articles. In addition, the consumption of energy for manufacturing molded articles can be reduced by using lower molding temperatures. For large scale manufacturing of molded articles, lowering 20°C or more of molding temperatures causes significant reduction of the total

cost for the manufacture.

8. I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the above-identified application or any patent issuing thereon.

Dated this 3rd day of April, 2009

Motoki Asahara

Motoki ASAHARA